CHAPTER 1 AVIATION ACTIVITY IN THE NATIONAL AIRSPACE SYSTEM

"Travelers are always discoverers, especially those who travel by air. There are no signposts in the air to show a man has passed that way before. There are no channels marked. The flier breaks each second into new uncharted seas."

~ Anne Morrow Lindbergh

1 Aviation Activity in the National Airspace System

Measuring aviation activity is a way of estimating the demand on airports and the air traffic control system. Capacity is an expression of their ability to meet that demand, so any analysis of capacity requires an analysis of current and future demand. The FAA measures aviation activity primarily in terms of passenger enplanements, revenue ton miles, and aircraft operations. By definition, only commercial passenger operations produce passenger enplanements and only cargo operations produce revenue ton miles, while all aviation activity produces aircraft operations (takeoffs and landings).

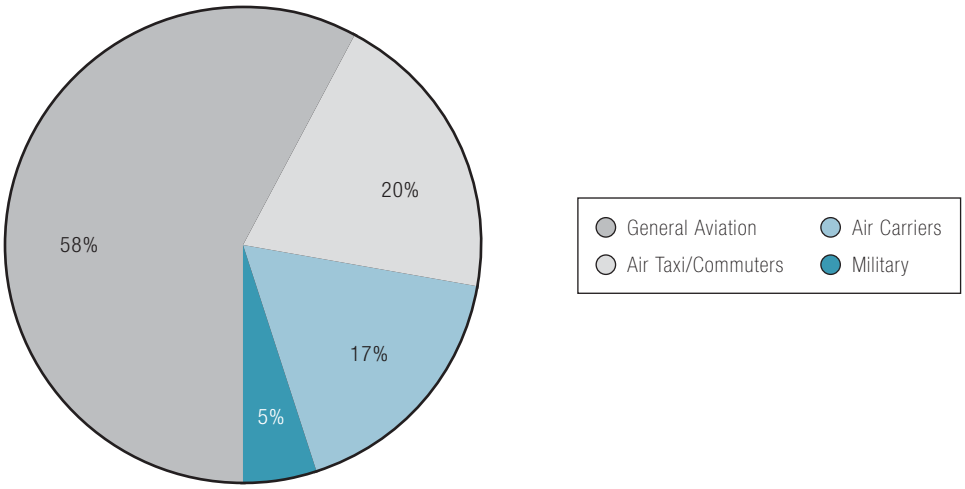
Three general types of aviation activity take place in the National Airspace System: commercial passenger and cargo transportation, general aviation, and military operations. Each type uses different types of aircraft, has its own patterns of operations, and places different demands on airports and the air traffic control system. This chapter briefly describes each type of aviation activity, recent trends in different measures of that activity, and FAA forecasts through FY 2014.

1.1 Aviation Activity

Within each of the general types of aviation activity, there are many kinds of operators that conduct a wide range of operations. Commercial activity includes large commercial air carriers, regional carriers, on-demand air taxis, all-cargo airlines, and others. All commercial activity is conducted within the FAA's air traffic control system, and is concentrated at the largest airports, usually near large metropolitan areas. General aviation includes private pilots flying on business, corporate jets, agricultural applications, and recreational and student pilots. The majority of general aviation activity (but by no means all) takes place at small airports far from urban centers and may have little or no contact with the air traffic control system. Much of the contact that general aviation pilots have is with the specialists at flight service stations rather than with air traffic controllers. However, general aviation does have a significant presence at some major airports. Military operations include flight training, weapons familiarization, and troop and equipment transport. Each of these types of activity use a variety of aircraft, including both fixed wing airplanes and helicopters, from an experimental home-built aircraft to a B-747 or a supersonic jet fighter. Military airports support most of the military traffic and the military's own air traffic control system handles most of their terminal operations.

The FAA tracks aircraft operations for four classes of users: air carriers, air taxis/commuters, general aviation operators, and the military. As Figure 1-1 shows, general aviation accounted for the majority of all aircraft operations in FY 2002, with air carrier and air taxi/commuters accounting for most other operations. Military operations made up a small fraction of all aircraft operations. The proportion of total operations by each user group does not vary much from year to year. Aircraft operations for all user groups for the busiest 100 airports for the past three years (both fiscal and calendar) are shown in Appendix A-2.

Figure 1-1 Aircraft Operations by User Type for FY 2002



1.1.1 Commercial Passenger Activity

Commercial aviation continued to struggle during 2002. Already reduced forecasts were revised downward as the gradual recovery to pre-recession traffic levels failed to take place as expected. However, FAA forecasts do show that passenger enplanements will reach 2000 levels by 2006. The aviation industry also showed signs of segmentation, as low-fare carriers continued to expand and earn small profits, while the hub-and-spoke carriers reduced capacity and incurred substantial losses. The shift of capacity from the hub-and-spoke carriers to their regional partners increased, as they tried to reduce costs, match capacity with demand, and maintain frequency in smaller markets by substituting regional jets with 50 to 70 seats for mainline jets with 110 seats or more.

Airports and aircraft manufacturers continued to be negatively affected as well, with airports facing reduced revenues and postponing some expansion projects and both Airbus and Boeing delivering far fewer aircraft than in recent years. These trends continued during the first nine months of 2003, although a relatively successful summer season resulted in record load factors and reduced losses for the hub-and-spoke carriers, and increased profits for the low cost carriers.

1.1.1.1 Passenger Enplanements

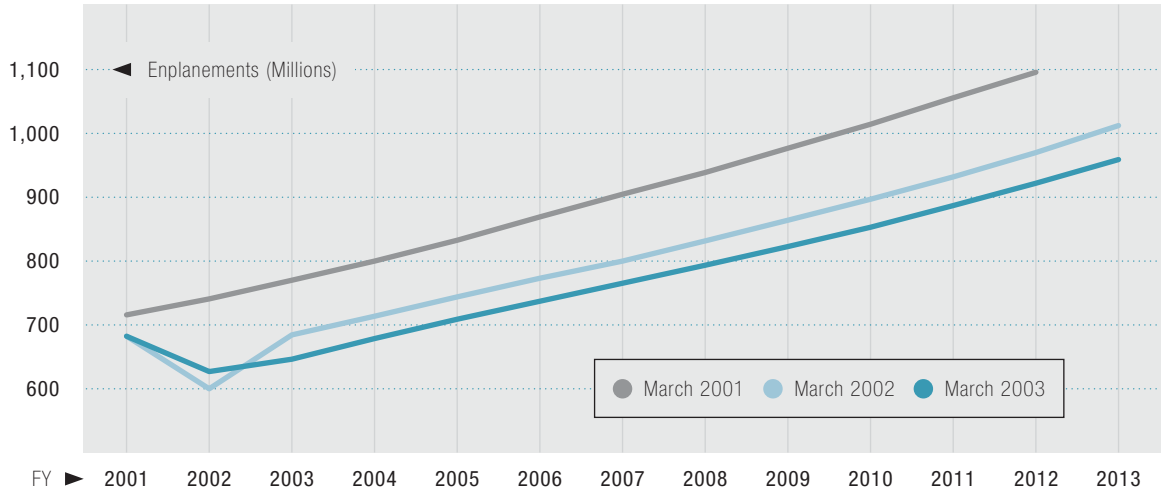
Passenger enplanements continued to decline in FY 2002, falling from the already depressed level of 682.5 million in FY 2001 to only 628.6 million (a decrease of 53.9 million enplanements or 7.9 percent). The total number of enplanements was slightly below the 631.4 million level of FY 1997, five years earlier.

Every year, the FAA prepares a 12-year forecast of aviation activity and presents it at the Annual FAA Aviation Forecast Conference in March.[1] Figure 1-2 compares the March forecasts for passenger enplanements for the past three years. The forecasts for March 2003 and March 2002 are well below the March 2001 forecast throughout the forecast period. During FY 2002, actual enplanements exceeded the March 2002 forecast (628.6 million rather than the forecast 600.3 million). However, the new FAA forecast further lowers projections for FY 2003 and all

1 FAA Aerospace Forecasts, Fiscal Years 2003-2014, U.S. Department of Transportation, Federal Aviation Administration, March 2003. Previous editions from March 2001 and March 2002 were also used.

subsequent years. The gap between the lines in Figure 1-2 shows the projected long-term impact of the economic slowdown and the subsequent restructuring of the aviation industry. The shortfall in enplanements translates into lost ticket revenue for the airlines, less excise tax revenue for the aviation trust fund, and lower passenger facility charge revenue to support airport enhancements.

Figure 1-2 FAA Forecasts of Passenger Enplanements



The United States has more than 400 commercial service airports, yet passenger enplanements are heavily concentrated at the busiest airports. Well over 90 percent of all enplanements take place at the 100 busiest airports. Enplanements for those airports for the past three years (both fiscal and calendar) are shown in Appendix A-1. The FAA forecasts for FY 2014 and the change from FY 2002 for those same airports are presented in Appendix A-3. The changes in enplanements from FY 2001 to FY 2002 are shown in Appendix A-5.

1.1.1.2 Aircraft Operations

As previously shown in Figure 1-1, the majority of aircraft operations in FY 2002 were general aviation operations, but the two categories of commercial activity, air carrier and air taxi/commuter, each accounted for a large number of aircraft operations (20 and 17 percent of all operations respectively). As with passenger enplanements, commercial aircraft operations are heavily concentrated at the nation's busiest airports, with over 80 percent of air carrier operations and 49 percent of air taxi/commuter operations at the top 55 airports.[2]

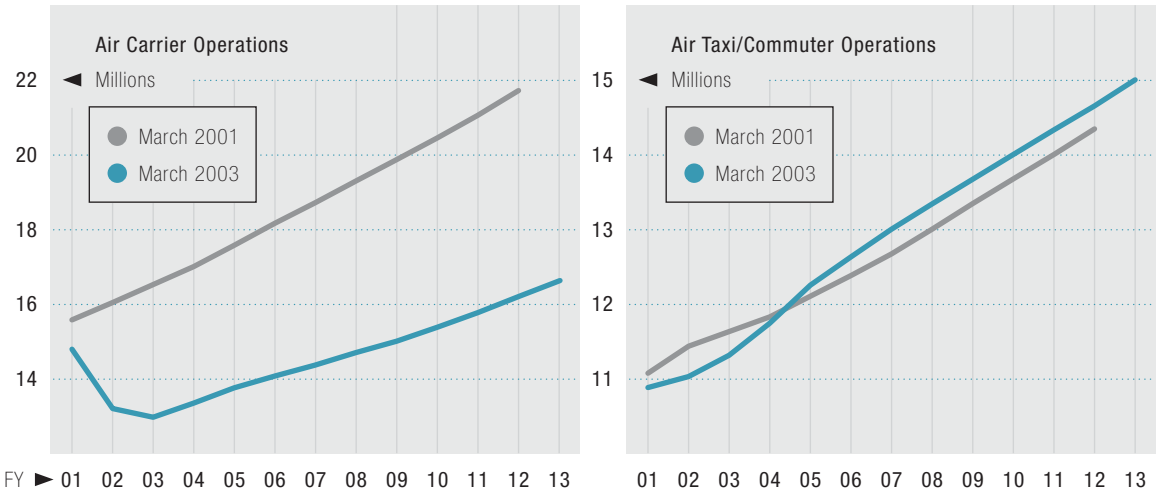
In FY 2002, commercial aircraft operations declined from 25.6 million in FY 2001 to 24.2 million (a decrease of 1.4 million operations or 5.5 percent). The overall figures mask the diverging trends in air carrier and air taxi/commuter operations. In the same period, air carrier operations dropped by 10.5 percent, reflecting the deep decline in the mainline operations of the major carriers. However, air taxi/commuter operations actually increased 1.4 percent, largely because of the substitution of regional jets for larger jets on many routes.

The FAA forecasts indicate that both of these trends will continue, with overall operations far below previous estimates, but with virtually all of the decline in air carrier operations. Figure 1-3

2 There are substantial numbers of general aviation and military operations at some of the nation's busiest commercial service airports.

compares the FAA forecasts for March 2001 and March 2003 for air carrier and for air taxi/commuter operations. The figure shows a sharp decline for air carrier operations for FY 2002 and FY 2003, with a recovery beginning in FY 2004 but with operations remaining far below those of the earlier forecast. In contrast, the figure shows air taxi/commuter operations increasing modestly in the early years of the forecast period, although below the levels of the previous forecast, and by FY 2005 actually exceeding the March 2001 forecast.

Figure 1-3 FAA Forecasts of Air Carrier and Air Taxi and Commuter Operations



1.1.2 Air Cargo Activity

Air cargo includes shipments of air freight, express packages, and mail. Summary data for air cargo activity are collected by the Department of Transportation and published by the FAA. This activity is measured in revenue ton miles (RTMs), where one revenue ton mile represents one ton of cargo flown for one mile. Air cargo is carried aboard both passenger aircraft and all-cargo aircraft, generally referred to as freighters. Aircraft operations for air cargo activity, for both passenger aircraft that carry cargo and all-cargo carriers, are included in the overall totals reported above.

In FY 2002, some 36 percent of air cargo shipments were transported in the belly space of passenger aircraft and 64 percent was transported in all-cargo aircraft. Two large all-cargo carriers dominate the air cargo market: FedEx with 31 percent and United Parcel Service with 16 percent of the total. However, several major passenger carriers also accounted for significant shares, including United Airlines (8 percent), Northwest Airlines (8 percent), and American Airlines (7 percent).

Air cargo activity continues to be affected by the economic slowdown and increasing worries about cargo security. In FY 2002, air cargo volume was approximately 27.3 billion RTMs, a decline of 3.9 percent from the already depressed levels of FY 2001. The FAA forecasts project that air cargo volume won't exceed FY 2000 levels until FY 2005.

Cargo traffic at individual airports is measured in tons loaded and unloaded. Not surprisingly, the airports where FedEx and UPS have hubs for their overnight package services are among the busiest cargo airports. Memphis, the main hub for FedEx, was the busiest cargo airport in CY 2002 and Louisville, the main hub for UPS, was the sixth busiest cargo airport. The ten busiest cargo airports and the change in the tonnage loaded and unloaded in CY 2002 are shown in Figure 1-4, based on data reported by the Airports Council International—North America.

Figure 1-4 Airports with the Most Air Cargo Activity for CY 2002

Airport (ID)	Metric Tons	Change from CY 2001
Memphis International (MEM)	3,390,800	28.8%
Los Angeles International (LAX)	1,779,855	(0.3%)
Ted Stevens Anchorage International (ANC)	1,771,595	(5.5%)
Miami International (MIA)	1,624,242	(0.9%)
New York John F. Kennedy International (JFK)	1,589,648	6.3%
Louisville International (SDF)	1,524,181	3.8%
Chicago O'Hare International (ORD)	1,473,980	13.4%
Indianapolis International (IND)	901,917	(18.9%)
Newark Liberty International (EWR)	850,050	(5.0%)
Hartsfield Atlanta International (ATL)	734,083	(0.2%)

1.1.3 Changes in the Commercial Sector

The commercial airline industry is in the midst of a major restructuring, characterized by a divergence in the growth of network carriers and low fare carriers, the continued replacement of mainline jets with regional jets, and the appearance of a new generation of regional jets with greater seating capacity and passenger comfort.

The divergence between hub-and-spoke carriers and low-fare carriers is clear in their financial performance since the economic downturn began. The hub-and-spoke carriers have incurred unprecedented losses, despite government aid, and two of the largest of them have declared bankruptcy. In the same period, the low-fare carriers have generally recorded profits. During the summer of 2003, as the result of relatively strong traffic and high load factors, the hub-and-spoke carriers' losses were less than had been expected, but observers don't expect to return to profitability for at least another year. In contrast, the low-fare carriers increased their profits during the summer and aviation analysts expect those carriers to continue to increase their profits during the next year.

Another important divergence between the hub-and-spoke and low-fare carriers is the relative change in domestic capacity. The hub-and-spoke carriers have reduced capacity throughout their systems by withdrawing older aircraft from service, deferring or canceling orders of new aircraft, and reducing service at selected hubs and in a large number of smaller markets. Some of the aircraft withdrawn from service have been permanently retired, well ahead of schedule, but a large number have been placed in long-term desert storage (well over 500 relatively new aircraft, some 10 percent of the 2001 fleet, are now in storage). Although the hub-and-spoke carriers have accepted some new aircraft, other orders have been deferred or cancelled, and virtually no new orders have been announced. The low-fare carriers, however, have added aircraft to their fleets by continuing to accept previously ordered aircraft and placing orders with both the mainline and regional jet manufacturers.

The hub-and-spoke carriers have also reduced capacity by scaling back operations at their less-profitable hubs and by either eliminating service in smaller markets or by transferring those routes to their regional affiliates, substituting regional jets for mainline jets. Although such changes preserve service and frequency in those markets, a smaller number of seats are now available, representing a significant reduction in capacity. Once again, the low-fare carriers have taken another path, deploying their new aircraft to both existing and new markets and poised to move into the hub airports that have been de-emphasized by network carriers, such as Pittsburgh and St. Louis. The

low-fare carriers now provide about 21 percent of domestic market capacity, up from 15 percent in 2000. Aviation analysts expect their share to reach 40 percent by 2006.

Since the introduction of the regional jet in the early 1990s, the number of regional jets in operation has increased dramatically, from only nine in 1993 to an estimated 976 in FY 2002.[3] The FAA estimates that this rapid growth will continue, topping 1,000 for the first time in FY 2003 and reaching as many as 2,834 in FY 2014. At that point, regional jets will make up 35 percent of the total passenger fleet, nearly doubling their current proportion. Regional jets have been used for a variety of purposes, including replacing turboprop service, providing additional capacity in mainline markets, replacing mainline service, and initiating new point-to-point service in some markets.

The commercial sector is also being affected by the development and introduction of larger regional jets. These jets, with 70 to110 seats, blur the distinction between regional jets and the smaller mainline jets. They are expected to be introduced in a variety of markets, following the pattern of growth of regional jets. Just as regional jets replaced turboprops, the large regional jets may replace smaller regional jets in some markets. In addition, as the airlines adjust capacity in individual markets to meet demand, large regional jets will replace mainline jets. Of particular significance was an order by Jet Blue, the fast-growing low fare carrier, for 100 Embraer EMB-190s, a planned 100-seat aircraft (with an option for another 100), to be delivered beginning in 2005, indicating that the use of regional jets is expanding into new areas. Previously, the low-fare carriers, such as Southwest, Air Tran and Jet Blue, have concentrated on smaller mainline jets for quick turnaround in markets between large cities or secondary airports near large cities. In contrast, Jet Blue is expected to use the EMB-100s to add point-to-point service in markets that are too small for Jet Blue's 162-seat Airbus A320s and to supplement mainline jet service in existing markets.

1.2 Non-Commercial Aviation Activity and Commercial Space Transportation

The non-commercial aviation sector consists of general aviation and military operations. Although these sectors do not receive as much notice as the commercial sector does, general aviation is vitally important to many sectors of the economy and military operations are a key element of national security policy. Commercial space transportation, which refers to the launch of an object into space by a non-governmental entity, is an important component of the economy.

1.2.1 General Aviation Activity

General aviation includes all segments of civil aviation except commercial air carriers. It is remarkably diverse in its activities, its participants, and the equipment they use. General aviation functions range from the training of student pilots to the operation of mainline jets for private individuals or companies. Its uses include sightseeing, agricultural application, the provision of emergency medical services, personal and corporate business travel, cargo movement, and flying for pleasure. The diverse general aviation fleets ranges from gliders and home-built experimental aircraft, to trainers and a variety single-engine piston aircraft, and to multi-engine piston aircraft and an enormous range helicopters, turbo props, and jets.

Most of the thousands of U.S. airports handle only general aviation traffic. Many of these are small, rural airports without an airport traffic control tower. Flights to and from these airports typically have little or no contact with the FAA's air traffic control system and don't contribute to airport

3 These estimates are from the FAA Aerospace Forecasts. The FAA defines a regional jet as an aircraft having 70 seats or less. Therefore, the forecasts do not include the new, larger regional jets, which will have as many as 100 seats.

or airspace congestion. Nonetheless, in FY 2002, almost 30 million general aviation operations took place at airports with airport traffic control towers, over 10 percent of total aircraft operations at those airports. General aviation also has a significant presence at the busiest commercial service airports. General aviation traffic accounted for 15.5 percent of total aircraft operations at the 35 Operational Evolution Plan (OEP) airports in FY 2002. Figure 1-5 shows that the percentage of general aviation operations at these airports varied from just 1.1 percent at Seattle-Tacoma to 25.6 percent at Honolulu.

Figure 1-5 General Aviation Operations at the OEP Airports

Airport (ID)	General Aviation Operations	Total Operations	% General Aviation Operations
Honolulu International (HNL)	80,825	316,089	25.6%
Fort Lauderdale-Hollywood International (FLL)	62,958	275,473	22.9%
Salt Lake City International (SLC)	79,739	401,491	19.9%
Washington Dulles International (IAD)	79,451	401,750	19.8%
Chicago Midway (MDW)	54,625	293,076	18.6%
Tampa International (TPA)	40,499	245,225	16.5%
Phoenix Sky Harbor International (PHX)	93,603	577,820	16.2%
Philadelphia International (PHL)	72,214	467,160	15.5%
Las Vegas McCarran International (LAS)	72,277	491,205	14.7%
Miami International (MIA)	61,577	442,358	13.9%
Minneapolis-St. Paul International (MSP)	68,377	497,934	13.7%
Portland International (PDX)	36,859	277,400	13.3%
Memphis International (MEM)	46,061	393,858	11.7%
Charlotte/Douglas International (CLT)	46,168	465,246	9.9%
Baltimore-Washington International (BWI)	30,417	310,281	9.8%
Orlando International (MCO)	27,891	303,328	9.2%
Cleveland Hopkins International (CLE)	20,559	264,075	7.8%
San Diego International Lindbergh Field (SAN)	15,005	201,604	7.4%
Greater Pittsburgh International (PIT)	23,701	439,360	5.4%
Lambert St. Louis International (STL)	24,122	453,302	5.3%
Greater Cincinnati International (CVG)	24,816	473,084	5.2%
Detroit Metropolitan Wayne County (DTW)	25,309	490,663	5.2%
George Bush Intercontinental (IAH)	23,362	458,649	5.1%
Boston Logan International (BOS)	19,367	405,370	4.8%
San Francisco International (SFO)	16,386	359,133	4.7%
Dallas-Fort Worth International (DFW)	24,917	762,371	3.3%
Newark Liberty International (EWR)	12,619	407,730	3.1%
Chicago O'Hare International (ORD)	24,290	901,703	2.7%
Denver International (DEN)	13,164	495,104	2.7%
New York LaGuardia (LGA)	9,104	354,218	2.6%
New York John F. Kennedy International (JFK)	7,166	291,021	2.5%
Los Angeles International (LAX)	15,306	637,588	2.4%
Hartsfield Atlanta International (ATL)	18,058	882,407	2.0%
Ronald Reagan National (DCA)	2,854	180,743	1.6%
Seattle-Tacoma International (SEA)	3,822	361,814	1.1%

1.2.2 Military Activity

Military operations account for a very small fraction of the activity at the nation's airports, accounting for just five percent of total operations in FY 2002. Military operations have increased slightly in the last two fiscal years as the result of increased training and patrols related to aviation security. The FAA projects a generally stable level of military operations throughout the forecast period.

Despite the relatively small number of military operations, they have a significant impact on navigation in the National Airspace System because substantial amount of U.S. airspace is designated as special use airspace and reserved for military operations. Special use airspace is available to commercial or general aviation operators only when the military opens a particular airspace area to non-military operations, usually for a specified time period. The procedures for sharing special use airspace are discussed in greater detail, later in this report.

1.2.3 Commercial Space Transportation

Commercial space transportation is an emerging industry, with new launch and recovery facilities at both inland and sea-based locations. Operators are developing new space vehicles, including evolved expendable launch vehicles and reusable launch vehicles.

Historically, commercial space operations have taken place at coastal ranges, using only expendable launch vehicles. Because of their infrequency and offshore trajectories, these space operations have had a minimal impact on National Airspace System operations. However, changes in the magnitude and complexity of space operations will place new demands on the National Airspace System. The expected increase in commercial launches and reentries, from a broad range of locations, will contribute to competition for airspace with other users. To address these issues, the FAA has developed a Space and Air Traffic Management System that supports both the evolving space transportation industry and existing aviation activities. This represents an expansion of the U.S. air traffic management system to integrate space and aviation operations